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AN EFFICIENT METHOD FOR MIXING LARGE OR SMALL QUANTITIES OF INSECTICIDAL DUSTS CONTAINING A CONDITIONER

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An apparatus and method for preparing derris or cube dust mixtures containing a conditioner (or wetter and spreading agent) for use in experiments with the pea aphid (Illinoia pisi Kalt.) was described by the writer in a previous publication.1/ Although the apparatus described therein was satisfactory for the preparation of small quantities of dust mixtures, it proved too small for effective use when large quantities of such mixtures were required. In order, therefore, to provide a mixer which would permit the rapid and effective preparation of either large or small quantities of dust mixtures, for large-scale or small-scale operations, a new apparatus was constructed, using as a basis a cement mixer which had an original capacity of 4 cubic feet, altered as shown in figures 1 to 4. The principle of mixing by means of a rotating drum containing stones was retained in this apparatus, and its capacity allows the preparation of quantities of dust mixtures ranging from 10 to 60 pounds.

In order to increase the capacity of the mixer, the truncated cone which formed the hopper of the concrete mixer was removed from its cast-iron base and was replaced by a cylindrical steel hopper of larger dimensions. This hopper (fig. 3) was made of 10-gauge steel and was 24 inches long and 26½ inches in diameter. A band of ⅛-inch square steel was welded around the outer upper edge of the hopper to strengthen it. Six ⅜-inch bolts, fitted with wing nuts, were welded to the outer rim to correspond with six slots cut in the cover flange. Regular clamp bolts with wing nuts may also be used for this purpose.

The cover (fig. 3) was made of ⅛-inch steel plate. It was fitted with handles and had a pipe connection in the center to receive a 1¾-inch pipe plug, for the purpose of providing a hole through which conditioning liquids may be atomized into the mixer while it is revolving. On the inner surface of the cover (fig. 4) was welded a flange of ¾-inch band iron, which fits inside the rim of the hopper. The entire cover is rather heavy, and it would be quite possible to make one of aluminum which would be easier to handle. A gasket of cork or similar material was fastened on the edge of the cover just outside the flange so as to make a tight connection with the hopper.

1/ Bronson, Theo. E. An improved apparatus for mixing insecticidal dusts. United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, ET-93, December 1936.

Two of the three baffle plates furnished with the original concrete mixer were fastened inside of the hopper (fig. 3). One of these was placed near the bottom so as to catch the majority of the stones used in the process of mixing at each revolution, carrying them part way up the hopper and dropping them back into the dust mixture. The other baffle was placed slightly forward so as to catch a good part of the dust which lies in the forward part (toward the cover) of the mixer. It is difficult to describe the exact angle and tilt which should be selected for each baffle plate. Their most effective location can be determined during the progress of building the apparatus, by revolving the mixer containing approximately 40 to 60 pounds of a sample insecticide and its diluent, together with the mixing stones. Several holes may be drilled in the hopper and the baffles shifted around as a result of experimental trials, until a satisfactory mixing of the dust appears to be attained; then the extra holes may be closed with short stove bolts.

The power to operate the mixer was derived from a one-half horsepower electric motor fastened to a bracket welded to the framework directly below the pulley on the mixer (fig. 4). A 2½-inch pulley on the motor, driving the 15½-inch pulley on the mixer, results in a speed of the mixer of 32 revolutions per minute. This appears to be approximately the maximum speed for satisfactory operation.

Figure 1 shows the mixer in its normal running position both for mixing the dust and for atomizing liquids into the dust. In incorporating liquid conditioning agents into the dust, an electric paint sprayer or similar outfit may be used, the plug in the center of the cover being removed while the atomizing takes place. Where compressed air is available, a sprayer run by compressed air may be used. An air pressure ranging from 25 to 50 pounds is maintained in the atomizing equipment. The mixer should revolve during this operation.

Figure 2 shows the method of emptying the hopper by tilting it in the opposite direction from that employed while mixing dusts. The entire contents may be emptied onto a large-mesh screen to separate the mixing stones from the dust.

To illustrate more specifically the application of this method of preparing dust mixtures, containing a conditioner, the following detailed example of the procedure is described, when it involves the preparation of a derris or cube dust mixture containing 1.0 percent of rotenone for use against the pea aphid.

The following ingredients are used:

a.	Derris or cube root powder (containing 4 percent of rotenone)	15.0 pounds
b.	Talc (or other suitable diluent)	43.2 "
c.	Conditioner (wetter and spreading agent)	0.6 "
d.	Water	1.2 "
	Total	60.0 "

The derris or cube root powder should be of such a degree of fineness that not less than 90 percent of it will pass through a sieve having 200 meshes per linear inch and all of the material (100 percent) should pass through a sieve having 80 meshes per linear inch. The talc or other suitable diluent used should be of such a degree of fineness that all of the material will pass through a sieve having 300 meshes per linear inch.

The derris or cube root powder and the diluent are first poured together into the mixer. Approximately 10 to 12 quarts of rounded stones, 1 to 1½ inches in diameter, are then placed in the mixer to aid in the mixing process. The cover of the hopper is clamped on, the mixer is placed in operation, and the material is mixed for 5 minutes. After this preliminary mixing, the mixture of the conditioner and water is atomized into the mixture of derris or cube root powder and talc inside the mixer (while the latter continues to roll) through the hole cut for this purpose in the center of the cover. The nozzle of the atomizer is inserted in this hole (fig. 1) and held steadily while the mixer, with its contents, continues to revolve. It requires usually about 3 minutes to atomize the proper quantity of the conditioner into a 60-pound batch of the dust mixture. As soon as this process is completed the hole in the center of the cover of the mixer is plugged, and the mixing is continued for a period of 25 minutes. At the expiration of this period the mixer is thrown over to the emptying position (fig. 2), and the dust mixture is dumped onto a large-mesh screen which separates the finished material from the stones.

Although talc has been mentioned specifically as a suitable diluent for use in preparing a dust mixture for combating the pea aphid, it should be emphasized that there are other available non-alkaline materials, such as finely ground clay, diatomaceous earth, infusorial earth, tobacco dust, or sulphur, which may be used for this purpose. Hydrated lime, however, should not be used as a diluent for derris or cube or other rotenone-containing insecticides.

In the majority of the experiments and field tests performed against the pea aphid, thus far, a proprietary conditioner designated as a sodium oleyl alcohol sulphate was used and proved satisfactory for the purpose. Other proprietary conditioners, including one material designated as an alkylphenyl-benzenesulfonic acid, also proved satisfactory.

Figure 1.--Power dust mixer modified from concrete mixer. Hopper with cover in position for mixing dust. Operation of atomizing liquid conditioner into dust is shown. The hopper should be rotated while atomization takes place.

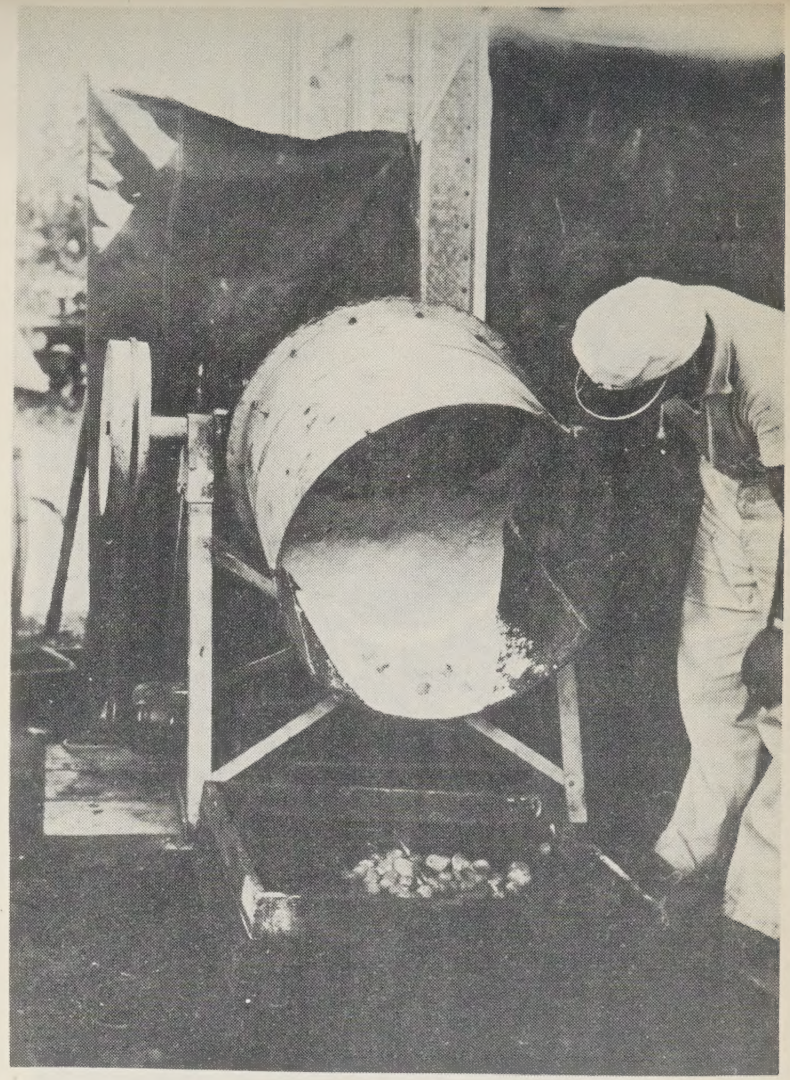

Figure 2.--Emptying mixed dust and stones onto large-mesh screen. To empty the hopper it is thrown in the opposite position from that in which mixing takes place.

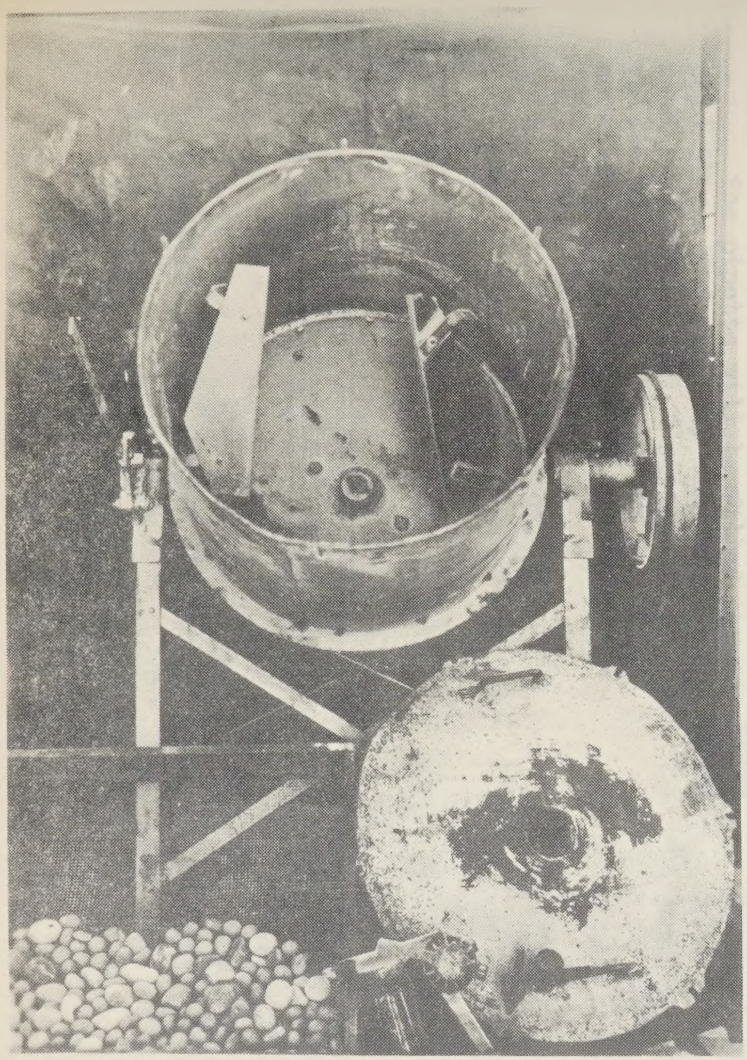

Figure 3.--Inside of hopper, showing relative position of two baffle plates which catch stones and dust at each revolution.

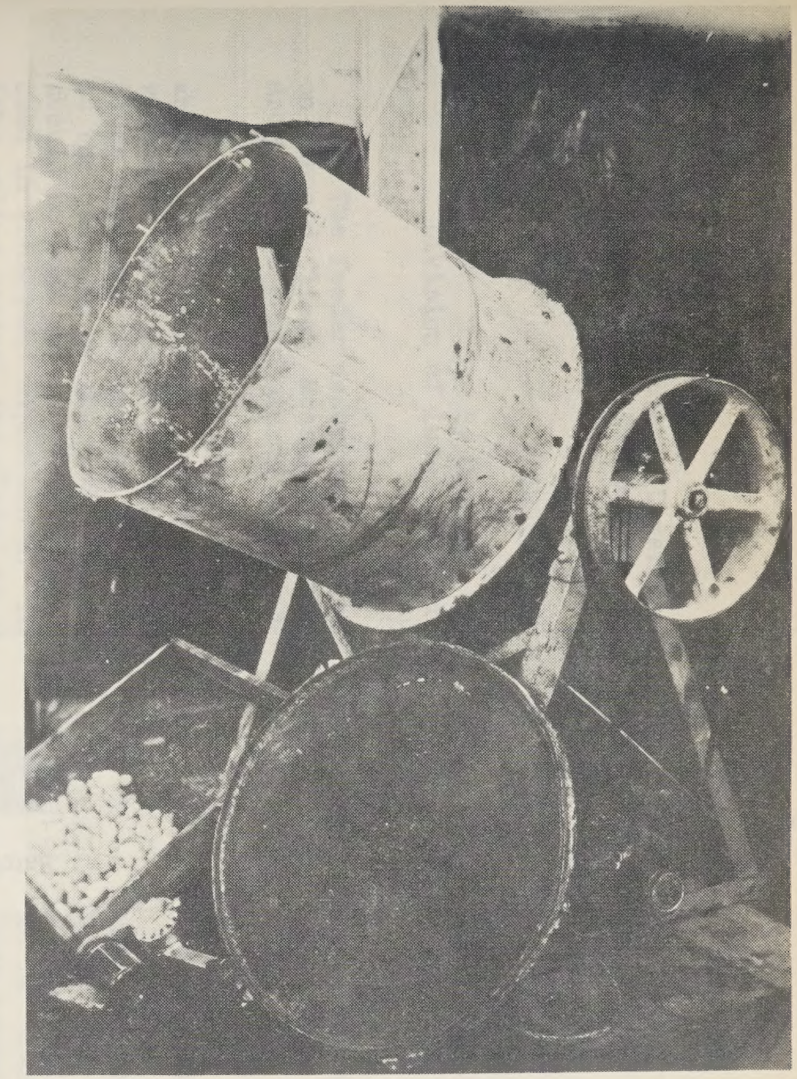

Figure 4.--Inside surface of cover shown with flange and fiber gasket just outside of flange. Electric motor mounted on bracket welded to mixer frame can be seen.